



# RADIO COMMUNICATIONS, EMI MEASURING TEST INSTRUMENTS

Selection Guide .....	432
Measuring Receiver .....	433
Radio Communication Analyzer .....	435
Frequency Converter .....	435
Interference/Field Strength Meters .....	435, 436
Antennas .....	436, 437
EMI Measuring Systems .....	438
EMI Probe .....	440
EMI Probe Kit .....	440
Optional Accessories .....	440

## Selection guide

(example of an application; various other types of measurement equipment are also available)

Type of measurement equipment	Anritsu model	Equipment to be measured								
		Mobile equipment			Base station			Service areas	Entrance circuitry	Parts
		Transmitter	Receiver	Maintenance, troubleshooting	Transmitter	Receiver	Construction, maintenance			
Time-domain-capable spectrum analyzer	MS2651B, MS2661B/C, MS2663C, MS2665C, MS2667C, MS2668C	√	√	√	√	√	√	√		√
	MS2683A	√	√	√	√	√	√	√		√
Signal generator	MG3641A		√	√		√	√	√		√
	MG3642A		√	√		√	√	√		√
	MG3633A	√	√	√		√	√			√
	68000C, 69000B	√	√	√		√	√		√	√
Power meter	ML2437A/2438A	√		√	√		√			√
	ML2407A/2408A	√		√	√		√			√
Frequency counter	MF2400B series	√		√	√		√			√
Measuring receiver	ML524B			√			√	√		
Site master	S331B			√			√			√
Network analyzer	54100A series						√			√
	MS4630B	√	√	√	√	√				√
	37200C series	√	√	√	√	√				√
Radio communication analyzer	MS555B	√	√	√	√	√	√			√

## EMI measuring instruments selection guide

Models and names		Frequency range or attenuation	Simplified EMI measurement system				
			Noise measures	Conducted interface	Interference power	Radiation noise	All items
Spectrum analyzers	MS2651B, MS2661B/C	9 kHz to 3 GHz	√	√	√	√	√
	MS2663C	9 kHz to 8.1 GHz	√	√	√	√	√
Pre-amplifier	MH648A	100 kHz to 1200 MHz	√		√	√	√
Pulse limiter	ESH3-Z2	9 kHz to 30 MHz		√			√
Absorption clamp	KT-10	30 to 1000 MHz			√		√
	KT-20	30 to 1000 MHz					
Dipole antenna	MP534A	25 to 520 MHz					
Tripod	MB9A	—					
Dipole antenna	MP651A	470 to 1700 MHz					
Tripod	MB9A	—					
Log-periodic antenna	MP666A	200 to 2000 MHz				√	√
Tripod	MB9A	—					
Pole	MB18B	—					
Biconical antenna	BBA9106	30 to 300 MHz				√	√
Line probe	3701	450 kHz to 30 MHz					
EMI probe	MA2601B/C	5 MHz to 1 GHz/1 to 50 MHz	√				√
Fixed attenuator	MP721B	6 dB				√	√
Programmable attenuator	MN63A	0 to 100 dB					
Printer	VP-870	—					
Plotter	MP5300-11	—					
System software	MX264001A (for MS2651B, MS2661B/C, MS2663C)	—		√	√	√	√

# MEASURING RECEIVER

## ML524B

25 to 1000 MHz

### For Measuring Service Area



Custom-made product

**GPIB**  
OPTION

The ML524B have a full range of features and functions plus demodulation functions for various signals. Their compact, lightweight construction makes them suitable for a variety of measurement applications. Use of the GPIB interface option allows easy configuration of an automatic test system controlled by a personal computer.

### Features

- Very compact and lightweight
- High frequency stability (A synthesizer local is used. Its reference oscillator has a high frequency stability of  $\pm 1 \times 10^{-6}$ .)
- Wide dynamic range (80 dB without switching)
- Automatic gain calibration

- Direct readout of field strength
- High precision level display (indication in 0.1 dB steps)

### Applications

#### For field strength measurement

- Investigation to determine service areas
- Radio wave propagation test
- Measurement of spurious radiation from transmitter

#### For other than field strength measurement

- Radio monitoring
- Measuring receiver
- High-sensitivity signal demodulation




### Specifications

RF input		Nominal impedance 50 $\Omega$ , N-type connector
Frequency	Range	25.0000 to 999.9999 MHz
	Display	Liquid crystal display, 6 digits Minimum digit: 1 kHz (0.5 kHz is displayed using a symbol of ■.)
	Resolution	12.5 kHz (120 kHz bandwidth), 1 kHz (15 kHz bandwidth)
	Setting	Keyboard and FINE dial
	Memory	Up to 100 frequencies can be stored and recalled.
	Reference frequency stability	$\pm 1 \times 10^{-6}$
Voltage measurement (E.M.F.)	Minimum value	5 dB $\mu$ V (25 to 300 MHz), 5 dB $\mu$ V (300 to 999.999 MHz)
	Maximum value	100 dB $\mu$ V (25 to 999.999 MHz)
	Setting	C/N: $\geq 6$ dB (at minimum value), Bandwidth: 15 kHz
	Accuracy (digital display)	$\pm 2$ dB ( $\geq$ minimum value +6 dB)
	Comparison oscillator	Pulse generator
Field strength measurement	Minimum value	-5 to 19 dB $\mu$ V/m (25 to 300 MHz), 19 to 32 dB $\mu$ V/m (300 to 999.999 MHz)
	Maximum value	0 to 114 dB $\mu$ V/m (25 to 300 MHz), 114 to 120 dB $\mu$ V/m (300 to 999.999 MHz)
	Setting	C/N: $\geq 6$ dB (at minimum value), Bandwidth: 15 kHz
	Type of antenna	Half-wave dipole
Selectivity	6 dB bandwidth	15 $\pm 2$ kHz (15 kHz bandwidth), 120 $\pm 20$ kHz (120 kHz bandwidth)
	Detuning characteristics	15 kHz bandwidth $\geq 50$ dB ( $\pm 20$ kHz off center)
Image ratio		$\geq 60$ dB (at 25.000 to 299.999 MHz), $\geq 45$ dB (at 300 to 999.999 MHz)
Residual spurious		$\leq 10$ dB $\mu$ V (typical near 50, 130, 600, 1000 MHz)
Detection system		Average value

Continued on next page

Measured level indication	Display: Liquid crystal display, 4 digits, Minimum digit 0.1 dB (on digital display), Up to 80 dB (on analog display) Unit: dBμV, dBμV/m (on digital display)
Monitor output	AM and FM can be heard from a loudspeaker, and earphone output terminal is also provided.
IF output	Level: ≥85 dBμV at 80 dBμV input, Impedance: 50 Ω (nominal), Connector: BNC-type
Discriminator output	Level: 1 V ±20% (modulation frequency: 2 kHz, frequency deviation: 3.5 kHz, into 100 kΩ load) Impedance: ≤150 Ω Connector: BNC-type
Output for recorder	Level: 1 V ±10% (at 80 dB on digital display, into 100 kΩ load), Impedance: ≤150 Ω, Connector: 3.5φ jack
Ambient temperature	0° to 50°C (operate), -20° to 60°C (storage)
Power	12 Vdc: <1 A 100 Vac, 50/60 Hz, ≤35 VA (using MZ114A AC Power Pack supplied) Ni-Cd battery (optional MZ110B Battery Pack)
Dimensions and mass	210 (W) x 60 (H) x 175 (D) mm, ≤4 kg

## Power supply selection guide

Type of power supply	Model	When used with ML524B	Remarks
Dry cell	MZ137A Battery Pack 	<ul style="list-style-type: none"> <li>Operates continuously for about 2.5 to 5 hours*1</li> <li>Sold separately</li> </ul>	<ul style="list-style-type: none"> <li>Twelve alkaline dry cells (LR20)</li> <li>Does not permit GPIB operation</li> </ul>
Ni-Cd battery	MZ110B Battery Pack 	<ul style="list-style-type: none"> <li>Operates continuously for about 30 to 60 minutes*1</li> <li>Sold separately</li> </ul>	<ul style="list-style-type: none"> <li>Six Ni-Cd batteries with the same dimensions as R14 battery, chargeable 200 to 300 times</li> <li>Fits inside the receiver</li> <li>Does not permit GPIB operation</li> </ul>
AC supply	MZ114A AC Power Pack 	<ul style="list-style-type: none"> <li>Permits operation at 100/220 Vac</li> <li>One of accessories supplied</li> </ul>	<ul style="list-style-type: none"> <li>DC power is fed to the EXT +12 V terminal of the receiver.</li> <li>Permits GPIB operation</li> <li>EMC, safety</li> </ul>
External DC supply	—	<ul style="list-style-type: none"> <li>The receiver can be operated directly from an external 12 Vdc supply.</li> </ul>	<ul style="list-style-type: none"> <li>One DC power cord is supplied.</li> <li>Permits GPIB operation</li> </ul>
Battery charger	MZ115B Battery Charger	<ul style="list-style-type: none"> <li>Sold separately</li> </ul>	<ul style="list-style-type: none"> <li>Two MZ110B can be charged simultaneously.</li> <li>EMC, safety</li> </ul>

\*1: For continuous reception after power on, with calibration performed once only (more calibrations reduce the operating time). Operating is also affected by how the battery has been stored, and operating temperature.

## Ordering information

Please specify model/order number, name, and quantity when ordering.

Model/Order No.	Name
ML524B	<b>Main frame</b> Measuring Receiver
J0231	<b>Standard accessories</b> Connecting cord for recorder (3.5φ plug · — · alligator clips), 1.5 m: 1 pc
J0144	DC power cord (RM12BPG-5S · 2CC7 · arrow tips), 1.5 m: 1 pc
A0002	Earphone: 1 pc
MZ114A	AC Power Pack: 1 pc
B0259	Carrying case: 1 pc
W0285AE	ML524A/B/C operation manual: 1 copy
ML524B-01	<b>Options</b> GPIB
ML524B-05	Terminated voltage indication

Model/Order No.	Name
	<b>Optional accessories</b>
MP612A	RF Fuse Holder
MP613A	RF Fuse Element (5 pcs/set)
A0004	Headphone
MZ110B	Battery Pack (with six Ni-Cd batteries)
MZ115B	Battery Charger
MZ114A	AC Power Pack
MP635A	Log-periodic Antenna
MZ137A	Battery Pack
MB19A	Tripod (for MP635A)
J0006	GPIB cable, 0.5 m
J0007	GPIB cable, 1 m
J0008	GPIB cable, 2 m
J0009	GPIB cable, 4 m
MP663A	Dipole Antenna (with pole and tripod)
MP651B	Dipole Antenna
MP18A	Pole (for MP651B)
MB9A	Tripod (for MP651B)
MP520B	CM Directional Coupler (25 to 1000 MHz, 75 Ω, NC-type connector)
MP520D	CM Directional Coupler (100 to 1700 MHz, 50 Ω, N-type connector)

## RADIO COMMUNICATION ANALYZER

### MS555B

25 to 1000 MHz

*For 400/800/900-MHz Narrow Band FM*



GPIO

The MS555B is a versatile, compact, and portable test instrument with a frequency range of 25 to 1000 MHz. It includes all the necessary instruments for both transmitter and receiver testing, and can measure such fundamental characteristics as output power, frequency, FM deviation, sensitivity, signal-to-noise ratio, distortion, etc. The MS555B has a host of features that make many discrete instruments obsolete. For example, with its excellent frequency stability and low residual noise, the built-in signal generator is ideally suited to the production and maintenance of narrow-band 400 MHz transceivers and 800/900 MHz band radiotelephone systems. Moreover, thanks to an internal microprocessor, the MS555B can make automatic measurements via the GPIO when connected to an external computer controller. The built-in printer also provides convenient hard copies.

#### Features

- This instrument includes a power meter, frequency counter, FM deviation meter, AF level meter, SINAD meter, AF oscillator, synthesized signal generator, and DC voltmeter, all in a single cabinet. Additional options include a tone generator, signalling unit for personal radio, and weighting filter\*.

\*: ITU-T, C-MESSAGE

## FREQUENCY CONVERTER

### MH669B

1 to 3 GHz

*Expandable to 3 GHz using ML524B*



The measurable frequency range can be expanded to 3 GHz by using the MH669B in conjunction with the ML524B Measuring Receiver.

#### Applications

- Quasi-microwave propagation test
- Investigation to determine service areas

## INTERFERENCE/FIELD STRENGTH METER

### ML518A, MH650A, MH649A

25 to 1700 MHz

*For Measuring Noise Field Strength (in Conformance with CISPR Specifications)*



ML518A Interference/Field Strength Meter  
MH650A Frequency Converter  
MH649A Preselector

The ML518A is a universal multi-purpose field strength meter with many functions and excellent performance in the frequency range from 25 to 1700 MHz. It can be used for investigating the service area of broadcast waves, radio transmission tests, measurement of spurious emissions of transmitters, measurement of antenna characteristics, and for measuring interference waves in conformity with the CISPR specifications.

#### Features

- A desired frequency can be precisely captured because a tuning frequency can be set up to 1700 MHz with an accuracy of 1 kHz.
- Quick response of the recorder output permits faithful recording of extreme field variations.
- Efficient measurement of interference waves in conformity with the CISPR specifications
- The average value, quasi-peak value, and peak value detection modes allow measurement of radio signals (TV, noise, etc.) which cannot be evaluated by the average value alone.

## INTERFERENCE/FIELD STRENGTH METER

### ML428B

9 kHz to 30 MHz

*For Measuring Noise Field Strength (in Conformance with CISPR Specifications)*



GPIB

The ML428B not only enables measurement of the field strength of general broadcasts and radio communications, but it can also perform measurements of interference waves in accordance with CISPR, VDE, FCC, or other specifications. The ML428B possesses a local synthesizer and high-precision sine-wave comparison oscillator to obtain data with excellent repeatability. In addition, the built-in microprocessor allows level calibrations and attenuator operation to be automatically performed to enable direct reading of the field strength and efficient measurement.

### Features

- Correct interference measurement can be performed in accordance with CISPR specifications.
- The use of a frequency synthesizer in the local oscillator enables a high degree of frequency stability to be gained.
- Allows direct reading of the field strength.
- Up to a maximum of any 100 frequencies can be stored.
- Prompt measurement is possible through use of the auto-range function.
- Direct readout of field strength is possible arbitrarily for conventional antenna by memorizing its coefficient via GPIB.
- Convenient outdoor operation through the use of a DC power source.

## DIPOLE ANTENNA

### MP534A/B, MP651A/B, MP663A

25 to 520 MHz

470 to 1700 MHz

300 to 1000 MHz

\*Tripod sold separately



MP534A



MP663A

Those half-wavelength dipole antennas are reference antennas, but the element length must be adjusted for each frequency to be measured.

## LOG-PERIODIC ANTENNA

### MP635A, MP666A

80 to 1000 MHz

200 to 2000 MHz



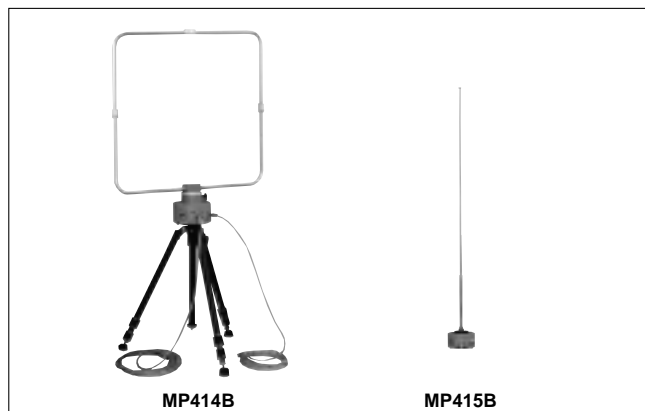
The gain remains roughly constant over a wide range so the element length does not require adjustment. Compared with dipole antennas, these antennas have a gain of 5 dB.

### Specifications

Model	MP635A	MP666A
Frequency range	80 to 1000 MHz	200 to 2000 MHz
Input impedance	50 $\Omega$ (connector: N-type)	
VSWR	$\leq 2.5$	
Average relative gain	5 dB	
Maximum input power	10 W	
Front-to-back ratio	$\geq 15$ dB	
Dimensions and mass	200 x 200 x 1750 mm, $\leq 7$ kg	$\varnothing 140$ x 900 mm, $\leq 5$ kg

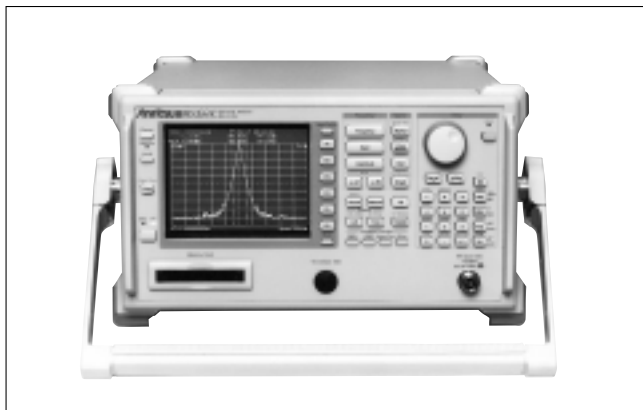
**LOOP ANTENNA, ROD ANTENNA**  
**MP414B, MP415B**

The MP414B/415B can be used with the ML428B Interference Field Strength Meter.



## EMI MEASUREMENT SYSTEMS

### MS2651B, MS2661B/C, MS2663C SPECTRUM ANALYZER



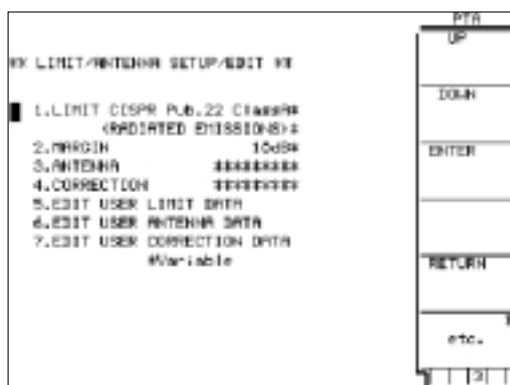
This is an EMI measurement system which uses MS2651B, MS2661B/C and MS2663C Spectrum Analyzers. An external controller is not required. Install the MX264001A EMI Measurement Software into the PTA function provided with the spectrum analyzer as standard, and then select the initial measurement conditions from the menu to perform the measurement. The measured data can be printed out, and also stored as a bitmap file.

Two measurement modes are available: pre-measurement and auto/manual evaluation measurement. The pre-measurement automatically registers the frequency point that exceeds the limit line (selectable from VDE0871, CISPR Pub. 22 ClassB, FCC, and USER 1 to 5). If the peak point to be evaluated cannot be detected, auto/manual evaluation measurement is not performed. QP(quasi peak value) or AVERAGE(average value) can be selected from the menu in the measurement mode.

#### • MX264001A EMI Measurement Software

##### Setup entry/edit

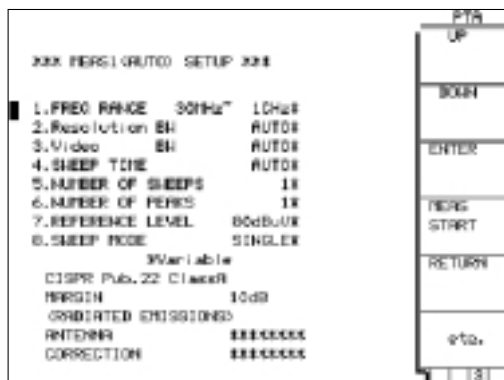
[Screen 1], the entry/edit mode screen, is displayed when EDIT MODE is selected from the measurement mode select menu. Multiple antenna coefficients and limit lines are registered so that the items can be easily selected from the menu. If an antenna coefficient and a limit line other than those registered on the menu are to be used, they should be entered using the panel keys. Five arbitrary data can be registered for each of the above items in the memory area.



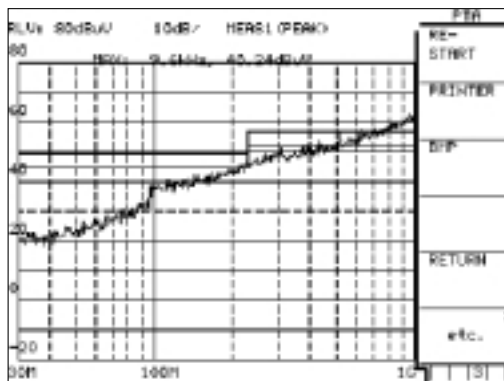
[Screen 1]: Entry/edit screen

##### Pre-measurement

The menu of [Screen 2] is selected by selecting PRE MEAS(A) from the measurement mode select menu. This allows measurement conditions such as the frequency range of the measurement system, the VBW resolution bandwidth, and the reference level to be set. [Screen 3] is displayed after the measurement is completed.



[Screen 2]: Pre-measurement mode setup screen

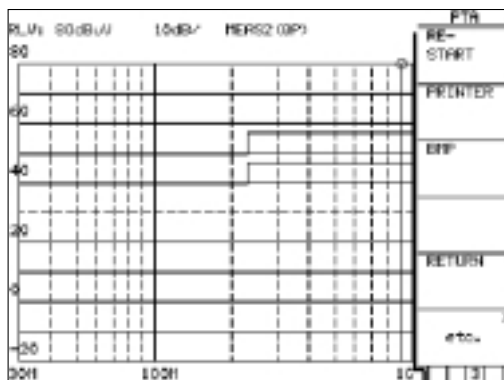


[Screen 3]: Pre-measurement exit screen

##### Auto evaluation measurement

The setup screen of auto evaluation measurement is displayed when EVA MEAS(A) is selected from the measurement mode select menu. This allows the modification of measurement conditions such as the auto measurement parameters, detection mode, resolution and reference level. After the completion of the measurement of the frequency point to be evaluated, the measurement result is displayed on [Screen 4] as a bar graph.

A ○ (arrow part) or a X mark is displayed at the top of the bar graph when QP detection or AVERAGE measurement is performed, respectively. A detailed measurement is also possible in the manual mode.

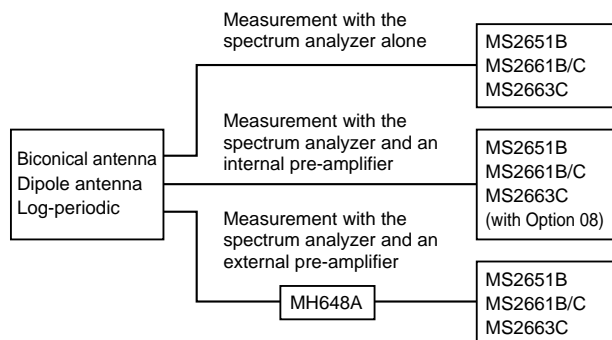


[Screen 4]: Auto evaluation measurement exit screen



## • Measurement system selection

The following measurement systems can be configured and used to perform the measurements using the MX264001A EMI measurement software.



## EMI PROBE MA2601B/C



Custom-made product

The MA2601B/C is a compact loop antenna to use with a spectrum analyzer or a field strength meter for EMI measurement. The combination is used to locate noise sources and to compare relative noise source levels.

### Features

- Exact detection of magnetic field components (because MA2601B/C is electrostatically shielded)
- Approximately flat magnetic-field detection characteristics in the range from 100 to 1000 MHz (MA2601B)

### Applications

- Sensing magnetic fields when it is connected to a spectrum analyzer, etc.
- Noise immunity testing of electronic components or electrostatic shield-effect testing with using a signal generator

## EMI PROBE KIT MA8611A

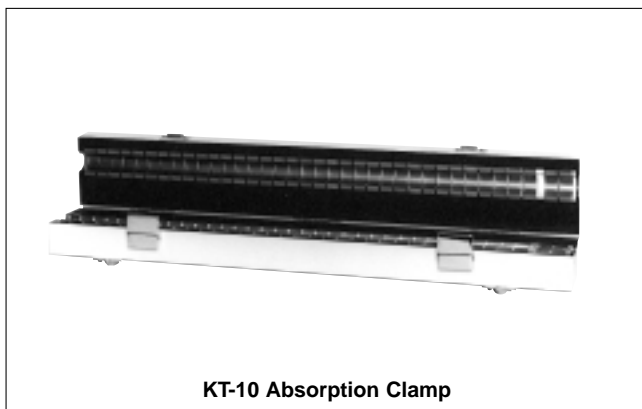


In addition to the MA8610A Pre-amplifier that can be directly mounted on the input connector of the MS610C and MS2601B Spectrum Analyzers, this kit also includes MA2601B/C EMI Probes and connecting cables.

### Specifications (MA8610A Pre-amplifier)

Frequency range	9 kHz to 2.2 GHz, 50 $\Omega$
Gain	20 dB
Frequency response	$\pm 0.5$ dB (20 kHz to 1 GHz)
Noise figure	6 dB typ. ( $\leq 1$ GHz)

## OPTIONAL ACCESSORIES



KT-10 Absorption Clamp

This current clamp absorbs interference conducted through the power cable of the device under test.

- Frequency range: 30 to 1000 MHz
- Impedance: 50  $\Omega$
- Applied regulations: CISPR, VDE